

Santa Fe, 52.9; Denver, 47.8; Pike's Peak, 73.0; Mt. Washington, 81.3.

### WINDS.

The prevailing winds during the month of February, 1882, at Signal Service stations are shown on chart No. II, by arrows which fly with the wind. Along the Middle Atlantic and New England coasts they are *northwesterly*. In the South Atlantic States, *southwesterly*. Between the meridians of 80° and 100° W., and from the Gulf northward to Lake Superior, *southerly*. In the Northern Plateau, Northern and Middle Slopes, *southwest to northwest*. In the Middle and Southern Plateaux, *variable*. In the North Pacific Coast Region, *southerly*. In the Middle and Southern Pacific Coast Regions, *variable*.

**High Winds.**—The following are the highest velocities attained on the summit of Mt. Washington, with direction at time of occurrence on the respective dates: 120 miles NW., 8th; 116, NW., 13th; 110, NW., 18th; 106, NW., 17th; 90, SW., 28th; 89, NW., 14th; 86, NW., 3d, and W., 19th; 85, NW., 6th and 10th; 84, NW., 16th; 82, NW., 11th; 80, NW., 4th and 15th; 76, NW., 20th; 75, NW., 12th. On all other dates during the month velocities reached or exceeded 50 miles per hour, with the exception of 23d, 24th and 25th. On summit of Pike's Peak the highest velocities reported are: 60, NW., 3d; 58, SW., 11th; 54, NW., 4th, W., 13th and SW., 18th; 53, SW., 17th, NE., 20th and NW., 28th; 50, W., 5th. Other stations reporting velocities of 50 miles per hour or over are as follows: Ft. Shaw, Mont., 62, SW., 14th. Stockton, Tex., 52, NW., 7th. Indianola, 56, SW., 28th; 51, N., 3d. Buffalo, 56, SW., 22d. Rochester, 56, S., 28th. Champaign, Ill., 51, SW., 21st. Eastport, 60, NE., 22d. New Shoreham, R. I., 64, NE., 5th; 60, NE., 4th. Sandy Hook, N. J., 56, NE 5th; 54, NE., 4th. Barnegat, N. J., 56, N., 5th; 50, NE., 21st. Cape May, N. J., 60, NW., 4th; 50, NW., 5th. Delaware Breakwater, 56, NE., 4th; 51, NW., 5th; 50, SW., 13th. Cape Henry, Va., 52, NE., 4th. Hatteras, N. C., 64, SW., 21st; 60, SW., 4th. Portsmouth, N. C., 52, SW., 4th and 21st. Umatilla, Or., 56, N., 16th. Thatcher's Island, Mass., 58, NE., 5th; 56, E., 22d.

**Total Movements of the Air.**—The following are the largest total movements at Signal Service stations: Mt. Washington, 27,334 miles; Pike's Peak, 14,257; Thatcher's Island, Mass., 12,277; Ft. Shaw, Mont., 12,189; Delaware Breakwater, 12,058; Cape May, 12,003; New Shoreham, R. I., 11,417; Portsmouth, N. C., 11,308; Hatteras, N. C., 11,285; Sandy Hook, 10,829; Kittyhawk, N. C., 10,353; Eastport, 10,314; Sandusky, 10,029; Barnegat, N. J., 9,848; Indianola, 9,807; Grand Haven, 9,447; Ft. Assinaboine, Mont., 9,446; Fort Benton, 9,134; Cape Henry, Va., 8,952; Milwaukee, 8,851; Chincoteague, Va., 8,545; Cheyenne, 8,540; Buffalo, 8,387; St. Vincent, Minn., 8,335; Boston, 8,095; Macon, N. C., 8,075; Alpena, 8,048; Madison, Wis., 8,008. The *smallest* are La Mesilla, N. M., 1,900; Visalia, 2,239; Florence, Ariz., 2,379; Lynchburg, Va., 2,600; Silver City, N. M., 2,641; Lewiston, Idaho, 2,712; Tucson, Ariz., 2,799; Ft. Missoula, Mont., 2,818; Augusta, Ga., 2,890; Salt Lake City, 2,952.

**Local Storms.**—Sitka, Alaska, December 19th, 1881. The following report of a most violent storm, although of late date, but from a very distant station, will be found of interest: Heavy gales, ranging from 30 to 50 miles per hour, accompanied by either rain, sleet or snow, began on the 5th, and continued to date. On the 19th, at 12.30 a. m., the gale increased to a hurricane, with violent gusts of over 70 miles per hour from the east, but no precipitation; temperature from 40° to 43°. At 1.55 a. m., storm showed no abatement in violence, at which time frequent observations were commenced with the following results: 1.55 a. m. barometer 29.06, thermometer 40°, wind E., 46 miles; 2.15 a. m., 28.99, 40°.5, E., 60; 2.36 a. m., 28.99, 40°, E., 64; 2.45 a. m., 28.98, 40°.5, E., 64; 3.07 a. m., 28.96, 40°.5, E., 62; 3.20 a. m., 28.96, 40°.5, E., 64; 3.30 a. m., 28.95, 40°.5, E., 64; 3.45 a. m., 28.92, 40°.5, E.,

66; 4.10 a. m., 28.89, 39°.5, E., 68; 4.30 a. m., 28.89, 39°, E., 56; 5 a. m., 28.82, 40°, E., 44; 5.30 a. m., 28.79, 40°, E. 46; 5.45 a. m., 28.80, 42°.5, SE., 44; 6.10 a. m., 29.04, 41°.5, SE., 41. At 6 a. m. the hurricane was terrible in the extreme, the castle (place of observation) rocked like a cradle and it seemed every moment as if the building would be moved from its foundation. At this juncture there was a loud crash as if the building were rent in twain and it shook more violently than before. Upon ascending to the roof a magnificent but awful scene met the gaze, sheet lightning flashed in fantastic shapes over the inky black sky, with fearful rapidity. Oceanward the waves were milky white with foam and their roar was heard above that of the storm. All the glass in the tower windows was broken and a portion of the roof blown away. The iron pointers beneath the anemoscope were so twisted as to be rendered useless. About this time the hurricane reached its maximum velocity, 80 miles, continuing for about five minutes. From this time until the following morning the storm gradually abated. 20th, 10 a. m., tide unusually high. In the harbor one steamer and a schooner, both of which were attached to a buoy, which was supposed to be immovable, had drifted over two cable-lengths from their original position. Most of the out-buildings along the beach were demolished and floated out to sea in small fragments. The roofs of a large number of houses in the village were seriously damaged, notably that of the castle, the church and the Custom House. Nearly all of the fences along the beach were prostrated. 11.30 a. m., gale abating; very heavy sea in the harbor. The bell-tower of the Sitka Mission House was thrown down in a perfect wreck. In the Indian village seven of the houses were unroofed and two of them partially destroyed. From various reports concerning the experience of many people in the village, it would appear very probable that a slight shock of earthquake occurred at about 6 a. m. or a short time before the occurrence of the maximum velocity of the hurricane. At 5.45 a. m. a quick, sharp report was heard, as if the building had been rent in twain. A few seconds after this report the large chimney of the guardhouse fell down, and in the Custom House a double door and frame work of solid logs was thrown down, the latter being separated from the side walls on the top and sides more than two inches. At the ware-house the outside entrance door had settled so much that it was only with great difficulty that it could be opened. In the office the floor and central wall were considerably disturbed and the clock which hung against the wall was found to be so far removed from the perpendicular that the pendulum touched the glass door. The direction of movement of shock was from northwest to southeast. The wind directions during the hurricane were from east slowly veering to southeast. The most violent gusts came from the south, veering slowly to the southwest and abating at a point a little west of southwest. The hurricane was one continuous, steady roar from east and southeast, changing its character to gusts of fearful violence from the south, with comparative lulls or calm spells at short intervals. 21st, 7 a. m., gale from the east increasing steadily up to 11.30 a. m., when a sudden gust shook the building with fearful force. The anemometer cups were carried away, but replaced again after a short interval. At noon found it impossible to take reading of the anemometer dial, owing to the violence of the wind and the thick, stinging sleet. The following observations were taken at short intervals: 11.19 a. m., barometer 29.04, thermometer 36°, wind E. 41 miles, cloudy; 11.30 a. m., 29.03, 36°, E. 40, cloudy; 12.10 p. m., 28.99, 36°.5, E. 42, sleeting; 12.30 p. m., 29.02, 35°, E. 44, heavy snow; 12.45 p. m., 28.99, 36°, E. 45, heavy snow; 1.15 p. m., 28.99, 36°, E. 36, light snow; 2 p. m., 28.94, 36°, E. 40, light snow; 2.20 p. m., 28.93, 37°, E. 47, light snow; 2.50 p. m., 28.94, 37°.5, E. 47, light snow; 3.07 p. m., 28.91, 38°, E. 44, light snow; 3.20 p. m., 28.90, 38°, E. 44, light snow. This storm, like that of the 19th, began with wind from the east, gradually veering to the south, when the temperature increased and a thaw and rain set in, continuing until midnight. Heavy gales, with rain or snow, con-

tinned to the end of the month as follows: 22d, E. 42 miles; 23d, NE. 33; 24th, SE. 40; 25th, SE. 32; 30th, E. 32; 31st, SE. 28. Austin, Tex., 1st, heavy northwest gale, which at times almost reached the violence of a tornado. Fences and trees were blown down and many buildings unroofed. Several houses were entirely demolished. Astoria, Or., 9th, violent southerly gale causing considerable damage to shipping in the harbor and in the city to signs, show windows, fences, shade trees and out-buildings. Ilwaco, Or., 9th, large ware-house leveled to the ground and several buildings unroofed. "The road across the portage to the weather beach was obstructed with fallen trees to such a degree that it will require a week's work to clear away the debris. From shore to shore across the Columbia bar the river was one mass of seething, milky foam, with tremendous sea." Rock Island, Ill., 21st, violent storm of wind and rain; a large portion of the government bridge, a solid stone and iron structure, was blown down; many buildings more or less damaged. Duluth, 21st, very violent wind storm from NNE., accompanied by driving snow. The sea on Lake Superior ran exceedingly high and all ice in the harbor was broken up. The suspension bridge over the canal badly damaged and rendered impassable. The wind and waves formed a huge breakwater of ice along the exposed shore. Pine Bluffs, Ark., 2d, "violent and desolating wind storm" passed over a portion of Jefferson county, laying waste cabins, houses, fences and trees. One person was killed and several injured. Findlay, Ohio, 21st, violent wind storm during early morning. Numerous out-buildings and fences demolished, trees uprooted. Buffalo, 22d, violent southwesterly gale. In some portions of the city it seemed to attain the violence of a tornado. For a space of about three minutes the anemometer registered a velocity of 80 miles per hour. A waterspout was reported to have been seen on Lake Erie between this city and Erie about the time the gale struck Buffalo. Umatilla, Or., 16th, heaviest wind storm experienced at this station for several years. Began at 10 a. m., violence gradually increasing. At 1 p. m. wind velocity 40 miles per hour, soon after reaching the maximum velocity of 56 miles from the north, when the wind suddenly died away. Dense clouds of sand filled the air and no one ventured out of doors; all business suspended. The sand and gravel dashed against windows and the sides of buildings, making a noise similar to that of heavy sleet. Olympia, Wash. Ty., 9th, heavy wind storm from south, accompanied by rain, which began at 11 a. m. Trees, fences and out-buildings were blown down, signs torn off and windows broken. Maximum velocity, 42 miles per hour, continued from 2.15 to 2.30 p. m. Delaware Breakwater, 4th, terrific storm prevailed throughout the day, the wind reaching a velocity of 56 miles. The sea washed over the office building, filling the rain-gauge and breaking down the wires of the "Breakwater air line." Schooner *Ellen Rockland*, from Portland to Norfolk, ran on the ice-break at 8.30 a. m. Eastport, Me., 5th, one of the severest storms that has visited this section for a long time. Two vessels went ashore near West Quoddy; others lost deck loads. 22d, very severe storm; about 50 feet of the breakwater to the entrance of Houstin's ship yard was destroyed, entailing a loss of about \$500. Several wharves were slightly damaged. New Haven, 21st, heavy gale; ten canal boats, loaded with coal, were sunk off Bridgeport, involving a loss of \$3,700. Chincoteague, Va., 1st, Schooner *Dolly Varden* wrecked on the beach during gale. New Orleans, 3d, 8.20 p. m., during heavy gale steamers *Thomas Dean* and *Frank Porgoud* were driven from their moorings and crushed the N. O. Pacific R. R. wharves, causing a large amount of damage. A coal fleet of ten barges were sent adrift, five of which were sunk in mid-stream; loss estimated at \$5,000. Mobile, 28th, between 9 a. m. and 1 p. m., severe wind and rain storm; telegraph lines prostrated; considerable damage done. Little Rock, 27th, 7.30 to 10.30 p. m. severe storm accompanied by thunder and heavy rain; streets were deluged; in some places water reached a depth of 3 feet. The electric display was unusually brilliant. The air was so charged with ozone that the odor was very ap-

preciable and persons subject to catarrhal affection complained of the irritating effect produced upon the throat and lungs. Several cases of damage from lightning have been reported. Columbus, Ohio, 21st, 6 p. m., severest storm experienced for years. In less than half an hour the wind increased from 10 to 40 miles per hour; buildings, chimneys, fences, etc., were blown down. Hogansville, Ga., 28th, violent wind storm; several houses destroyed. Spiceland, Ind., 21st, 3 to 3.30 a. m., very high winds, out-buildings blown down and unroofed, trees, etc., blown down. Coalville, Utah, 9th, and 16th, heavy wind storms; large number of trees were blown down and the water in the Sound made very rough.

### VERIFICATIONS.

*Indications.*—The detailed comparison of the tri-daily indications for February, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 87.16 per cent. The percentages for the four elements are: Weather, 86.44; Direction of the Wind, 84.25; Temperature, 88.15; Barometer, 89.72 per cent. By geographical districts they are: For New England, 90.1; Middle Atlantic States, 92.5; South Atlantic States, 86.9; Eastern Gulf States, 85.8; Western Gulf States, 86.9; Lower Lake Region, 88.5; Upper Lake Region, 84.5; Tennessee and the Ohio Valley, 87.8; Upper Mississippi Valley, 86.1; Lower Missouri Valley, 81.1; Northern Pacific Coast Region, 98.2; Middle Pacific Coast Region, 97.1; Southern Pacific Coast Region, 93.7. There were 100 omissions to predict (37 being due to the absence of reports from the Pacific coast) out of 3,444, or 2.90 per cent. Of the 3,344 predictions that have been made, 126, or 3.77 per cent. are considered to have entirely failed; 119, or 3.56 per cent. were one-fourth verified; 351, or 10.50 per cent. were one-half verified; 159, or 4.75 per cent. were three-fourths verified; 2,589, or 77.42 per cent. were fully verified, so far as can be ascertained from the tri-daily reports.

*Cautionary Signals.*—139 Cautionary signals were displayed during the month of February, 1882, of which 130, or 93.52 per cent. were fully justified by winds of twenty-five miles per hour, or over, at or within a radius of 100 miles of the station. 76 Off-shore signals were displayed, of which 60, or 78.94 per cent. were fully justified; 68 or 89.47 per cent. were justified as to direction; 76, or 100.0 per cent., were justified as to velocity. 52 Off-Shore signals were changed from Cautionary. Two Northwest signals were displayed, both of which were fully justified. 217 signals of all kinds were displayed, of which 192 or 88.48 per cent., were fully justified. The above does not include signals ordered at 69 display stations, where the velocity is only estimated. 183 winds of 25 miles or more, were reported, for which no signals were ordered. 27 signals were ordered late.

### NAVIGATION.

*Stage of Water in Rivers.*—In the table on the right-hand side of chart No. III are given the highest and lowest stages of water as observed at Signal Service stations during the month of February, 1882. Throughout the Lower Mississippi and Ohio Valleys and along the Red and Arkansas rivers the heaviest floods for years prevailed during the month. In consequence the stage of water in these rivers has been remarkably high, as shown by the following figures: The Red River reached its highest stage at Shreveport on the 21st, being 31 feet and 5 inches above low water-mark, or 18 inches above the danger-line. The Arkansas river reached its highest stage at Little Rock on the 24th, being 21 feet and 8 inches above low water mark. The Missouri was frozen over during the month at Yankton, but reached its highest stage (a very moderate one) on the 14th at Leavenworth, and on the 27th and 28th at Omaha. The Mississippi remained frozen during the month at St. Paul and LaCrosse, and at a low stage from the 1st to 28th at Dubuque, Davenport and Keokuk. From St. Louis to New Orleans reached its highest stage as follows: St. Louis, 22nd, 28 feet and 3 inches above low-water mark, or 21 inches